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Gulf Region

Proceedings of the regional peer review on the status of emerging fisheries species in the southern Gulf of St. Lawrence: hagfish (*Myxine glutinosa*)

December 18, 2015
Moncton, New Brunswick

Chairperson: Hugues Benoît

Fisheries and Oceans Canada
343 University Avenue
Moncton, New Brunswick, E1C 9B6

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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

The fishery for hagfish (*Myxine glutinosa*) in the southern Gulf of St. Lawrence started in 2011 with the issuance of four *Exploratory Licences*. The purpose of these exploratory licences is to determine if the stock can sustain a commercially viable operation and to collect additional biological data. The exploratory licences are for the Gulf Nova Scotia portion of NAFO Div. 4T and have a number of conditions associated with them. A hagfish conservation harvesting plan for the Gulf Nova Scotia sector was developed. DFO Fisheries and Aquaculture Management (FAM) requested an assessment of the status of hagfish in the southern Gulf of St. Lawrence to assist in the decisions required regarding the continuation of the exploratory status of the hagfish fishery in the southern Gulf of St. Lawrence. A regional science peer review meeting to address the request for advice from FAM was held December 18, 2015 in Moncton, New Brunswick. Participants included DFO staff from the Gulf region, fishermen and academia.

Compte rendu de la revue régionale par les pairs sur l'état des espèces des nouvelles pêches dans le sud du golfe du Saint-Laurent : la mxyine du nord (*Myxine glutinosa*)

SOMMAIRE

La pêche de la myxine (*Myxine glutinosa*) dans le sud du golfe du Saint-Laurent (sGSL) a débuté en 2011 avec la délivrance de quatre permis de pêches exploratoires. Le but de ces permis exploratoires est de déterminer si le stock peut soutenir une exploitation commercialement viable et recueillir des données biologiques supplémentaires. Les permis exploratoires, valides dans la portion de la division 4T de l'OPANO de Golfe Nouvelle-Écosse, ont un certain nombre de conditions qui leur sont associées. Un plan de pêche axé sur la conservation pour la myxine a été élaboré pour le secteur de Golfe Nouvelle-Écosse. La Gestion des pêches et de l'aquaculture (GPA) du MPO a demandé une évaluation de l'état de la myxine dans le sud du golfe du Saint-Laurent afin de faciliter les décisions concernant la poursuite du statut de la pêche exploratoire à la myxine dans le sud du golfe du Saint-Laurent. Une réunion régionale d'examen scientifique par les pairs pour répondre à la demande d'avis de la GPA a eu lieu le 18 décembre, 2015, à Moncton, au Nouveau-Brunswick. Les participants à cette réunion comprenaient le personnel du MPO de la Région du Golfe, un pêcheur et un chercheur du milieu universitaire.

INTRODUCTION

The fishery for hagfish (*Myxine glutinosa*) in the southern Gulf of St. Lawrence (sGSL) started in 2011 with the issuance, under Section 7 of the Fisheries Act, of four *Exploratory Licences*. The purpose of these exploratory licences is to determine if the stock can sustain a commercially viable operation and to collect additional biological data (see DFO's New Emerging Fisheries Policy (revised 2008)). The exploratory licences are for the Gulf Nova Scotia portion of NAFO Division 4T and have a number of conditions associated with them. A hagfish conservation harvesting plan for the Gulf Nova Scotia sector was developed. DFO Fisheries and Aquaculture Management (FAM) asked for an assessment of the status of hagfish in the sGSL to assist in the decisions required regarding the continuation of the exploratory status of the hagfish fishery in the sGSL.

A regional science peer review meeting to address the request for advice from FAM was held December 18, 2015 in Moncton, New Brunswick. The terms of reference for the science peer review are presented in Appendix 1. The list of participants at the peer review meeting are in Appendix 2 and the agenda is found in appendix 3.

One working paper that addressed the terms of reference was distributed to participants on December 17, 2015. The working paper was presented by Rod Morin (DFO Science). There was a discussion among the participants at the end of each section, which roughly corresponds to the terms of reference for the review. The following summarizes key elements from the peer review and discussion.

OVERVIEW OF THE BIOLOGY AND ECOLOGY OF HAGFISH

Additional points that were raised during the discussion included:

- Based on available genetic information, there is no stock structure for Atlantic Hagfish.
- Grant et al. (2009) concluded that hagfish are likely slow growing and long-lived and may have an advanced size (age) at maturity.
- There is a reported clinical variation in size at maturity, with larger size at maturity in the Gulf of Maine although the methods for determining maturity need to be standardized.
- Overall, there are large uncertainties on biology and ecology as there is sparse information on growth, natural mortality, size at maturity, or generally speaking, information on productivity.

DISTRIBUTION, RELATIVE ABUNDANCE, AND THE CHARACTERISTICS OF HAGFISH

Fishery independent data were presented based on two main sources of information: 1) September Research Vessel bottom trawl survey and 2) 1991 Gulf hagfish trap survey.

Rapidly developed fisheries in Japan have led to considerable stock reductions. In NAFO 3O, the fishery led to declines in available hagfish, causing the fishery to shift spatially. In NAFO 3Ps, they have seen slower declines but also dwindling size of animals in the catches (see review by Scott and Sullivan 2013). There has been no fishing in Newfoundland (NF) in 2014 and 2015, partly in response to a request for additional observer coverage due to low compliance of logbooks, but also partly due to declines in catches of marketable fish. There is evidence that markets increasingly want smaller hagfish. This may be in part because the

availability of larger fish has declined, but is also due to a growing market for small "aphrodisiac" hagfish.

SOURCES OF UNCERTAINTY

There are uncertainties in the abundance of hagfish. Existing surveys provide information for which the precision is too low to track changes in size composition or abundance on an inter-annual basis. There are also uncertainties in the amount of hagfish discards and discard survival. The level of discarding is self-reported in logbooks and can be substantial. Better estimates from observer reports would be very useful. Discard survival is likely close to nil in spoiled catches, however is very uncertain for live hagfish.

RECOMMENDATIONS

Recommendations from the review are listed below:

1. Additional biological data on the size at reproduction and sex ratios should be collected during existing trawl surveys.
2. Existing survey data only tracks order of magnitude (large scale) changes in abundance over time and coarse patterns in spatial distribution. If data with higher precision is required to support management, dedicated industry-funded trap surveys would likely be the best approach. Some work would be required to determine the parameters of such a survey.
3. Fishery dependent information collected by observers, dockside monitors or in logbooks needs to be transmitted to DFO and incorporated in the relevant databases in a timely manner. Presently, much of this information is not in the databases. Data on additional parameters will need to be collected, such as the number of barrels in observer reports.
4. There is a need to review the size at 50% maturity of hagfish in the Gulf. Current information indicates a clinal variation in size at maturity with estimates of 395 mm on the Grand Banks and Saint-Pierre Bank, 340 mm in NAFO Div. 3Pn, and 450 mm in the Gulf of Maine. The collection of biological information, particularly individual lengths and determination of maturity, need to follow standardized protocols since there is considerable scope for different interpretation using different methodology.
5. There is a need to review fishing practices in the Gulf hagfish fishery, notably:
   a. To identify appropriate soak times to reduce catch spoilage and discarding; current fishing practices include very long soak times.
   b. To ensure that the nominal size, number and location of escape holes is optimal for releasing undersized hagfish; current regulations in the Gulf impose a ½ inch minimum hole size; such a size was found to be too small in the Newfoundland fishery.
   c. Measures to ensure that the number of barrels used is in accordance with the ability to tend the gear; currently there are cases of long soak times due to the gear being left in the water because the harvesters did not have the capacity to haul all of their gear in one trip. In Newfoundland, the TAC is spread out spatially as a function of the fisheries ability to properly process their catch while reducing spoilage and discards.
   d. There is evidence of spoiled catches associated with high densities of amphipods (sand fleas), though it is not clear if the amphipods caused the spoilage or if they were drawn by it. Similar problems were seen in the Newfoundland fishery. Documenting and then

avoiding areas with high amphipod densities might improve catch quality and reduce discarding. In Newfoundland, there is depth-dependency to the abundance of amphipods.

6. There is a required nominal observer coverage in this fishery (20%); however that target has rarely been attained in recent years despite the harvesters complying with hail provisions. Measures need to be put in place to ensure that the required number of trips are covered by observers since observers provide data on a set-by-set basis, which is not possible from dockside monitoring. Furthermore, observers can provide reliable information on discarded catch amounts.
7. Tracking the count per pound (lb) of hagfish in catches by observers, dockside monitoring and port samplers would be an easy indicator of the size composition of catches.
8. The following items should be added to the Research Document:
   a. A table detailing annual numbers of licences, trips, observer reports and dockside length frequencies for the Gulf fishery.
   b. A graph of the relative landings and effort (i.e., without a scale).
   c. A graph of the relative discard amounts (% discards) by year.
   d. A graph of discard amounts as a function of soak times.
   e. Plots of aggregated length frequencies from the research vessel surveys (5 yr blocks)
   f. Mention the January Sydney Bight surveys – note however that while hagfish were caught in small numbers throughout these surveys, there are no discernable areas of concentration.

REFERENCES CITED

Grant, S.M., Hiscock W., and Bishop G. 2009. Exploratory fisheries and resource assessment of Atlantic hagfish (*Myxine glutinosa*) in the Newfoundland and Labrador Region. In: DFO. Proceedings of a workshop on Canadian Science and Management Strategies for Atlantic hagfish. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2009/009. pp 6-8.

Grant, S.M. and Sullivan R. 2013. Update of the Atlantic hagfish (*Myxine glutinosa*) fishery in NAFO Subdivision 3Ps: 2005-2012. MS Report to Policy and Planning Branch, Newfoundland and Labrador Department of Fisheries and Aquaculture. Centre for Sustainable Aquatic Resources, Fisheries and Marine Institute of Memorial University of Newfoundland, St. John's, NL. Rep. P409. 32 p.

APPENDICES

Appendix 1. Terms of reference

Status of emerging fisheries species in the southern Gulf of St. Lawrence: hagfish

Regional Peer Review – Gulf Region

December 18, 2015
Moncton, New Brunswick

Chairperson: Hugues Benoît

Context

Hagfish (*Myxine glutinosa*) was first fished in eastern Canada in 1989 in the Scotian Shelf area (NAFO Div. 4X). Landings of hagfish in eastern Canada reached a maximum to date of greater than 3,600 t with over half the landings reported from NAFO Div. 4W. The fishery for hagfish in the southern Gulf of St. Lawrence started in 2011 with the issuance under Section 7 of the Fisheries Act of four *Exploratory Licences*. The purpose of these exploratory licences is to determine if the stock can sustain a commercially viable operation and to collect additional biological data (see DFO New Emerging Fisheries Policy (revised 2008)). The exploratory licences are for the Gulf Nova Scotia portion of NAFO Div. 4T and have a number of conditions of licence. A hagfish conservation harvesting plan for the Gulf Nova Scotia sector was developed.

DFO Fisheries and Aquaculture Management (FAM) asked for an assessment of the status of hagfish in the southern Gulf of St. Lawrence to assist in the decisions required regarding the continuation of the exploratory status of the hagfish fishery in the southern Gulf of St. Lawrence.

Objectives

The science review will consider the following questions:

- Overview of the biology and ecology of hagfish,
- Summary of the distribution, the relative abundance, and the characteristics (size distribution, size/age at maturity) of hagfish within and at the boundary areas of the southern Gulf of St. Lawrence
- Overview of fishery activities and characteristics of the hagfish exploratory fishery undertaken to date in the southern Gulf of St. Lawrence
- Review of hagfish fisheries in other regions of Canada and approaches used to manage the fisheries
- Identification of knowledge gaps and recommended research to address these gaps

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document

Participation

- Fisheries and Oceans Canada (DFO) (Ecosystems and Oceans Science, Ecosystems and Fisheries Management)
- Invited experts
- Fishing industry

Appendix 2. List of participants

Name	Affiliation
Benoît, Hugues	DFO Science Gulf Region
Boudreau, Brian	Fisherman
Butruille, Fréderic	DFO Fisheries and Aquaculture Management (FAM)
Chaput, Gérald	DFO Science Gulf Region
Dwyer, Alan	DFO Science Gulf Region
Grant, Scott	Marine Institute of Memorial University of Newfoundland
LeBlanc, Sophie	DFO Science Gulf Region
Morin, Rod	DFO Science Gulf Region
Rondeau, Amélie	DFO Science Gulf Region
Surette, Tobie	DFO Science Gulf Region

Appendix 3. Agenda for the regional peer review on the status of emerging fisheries species in the southern Gulf of St. Lawrence: hagfish.

Regional Science Peer Review Meeting
Status of emerging fisheries species in the southern Gulf of St. Lawrence: hagfish
Gulf Fisheries Centre / WEBEX

Friday December 18, 2015	**Time**
Opening remarks and review of agenda	9:30 – 9 :40 am
Review of working paper by Morin et al	9:40 am – 11:30 am
Review summary bullets and conclusions for Science Advisory Report	11:30 am – 1:00 pm
End of meeting	1:00 pm